WHAT IS CLAIMED IS:

1. An optical structure for metal-enhanced fluorescence sensing, comprising:

an optical fiber having a conductive external coating;

fluorophores disposed adjacent to said conductive external coating;

a detector disposed at one end of said optical fiber;

wherein fluorescence emissions of said fluorophores are coupled into said conductive external coating and into said optical fiber, and detected by the detector.

2. An optical structure for metal-enhanced fluorescence sensing according to claim 1, wherein said fluorescence emissions coupled into said optical fiber being totally internally reflected within said optical fiber in a direction towards said detector, which detects said fluorescence emissions.

3 An optical structure for metal-enhanced fluorescence sensing according to claim 1, further comprising:

a refractive index boundary being a surface of said optical fiber;

a first and second refractive index on either side of said refractive index boundary;

said optical fiber having said second refractive index, wherein said second refractive index is greater than said first refractive index; and

a stimulating light;

wherein, when an angle of incident of said fluorescence emission on said refractive index boundary is greater than a critical angle (θ_c), said fluorescence emission coupled into said optical fiber is totally internally reflected upon application of the stimulating light.

4 An optical structure for metal-enhanced fluorescence sensing according to claim 1, wherein said conductive external coating on said optical fiber is a semi-transparent metal.

5 An optical structure for metal-enhanced fluorescence sensing according to claim 1, wherein said conductive external coating on said optical fiber comprises metallic islands.

6 An optical structure for metal-enhanced fluorescence sensing according to claim 1, wherein said conductive external coating on said optical fiber comprises spherical colloids.

7 An optical structure for metal-enhanced fluorescence sensing according to claim 1, wherein said conductive external coating on said optical fiber comprises a noble metal.

8 A method of metal-enhanced fluorescence sensing, comprising:

applying a conductive coating to a surface of an optical fiber;

introducing a solution containing analytes to said conductive coating;

employing surface plasmon excitation to cause an excitation of fluorophores adjacent to said conductive coating;

coupling said fluorescence emissions of said fluorophores into said conductive coating and into said optical fiber, and detected by a detector.

9. A method of metal-enhanced fluorescence sensing according to claim 8, wherein said fluorescence emissions being totally internally reflected within said optical fiber in a direction towards the detector.

10. A method of metal-enhanced fluorescence sensing according to claim 8, wherein said conductive coating on said optical fiber is a semi-transparent metal.

11. A method of metal-enhanced fluorescence sensing according to claim 8, wherein said conductive coating on said optical fiber comprises metallic islands.

12. A method of metal-enhanced fluorescence sensing according to claim 8, wherein said conductive coating on said optical fiber comprises colloid spheres.

13. A method of metal-enhanced fluorescence sensing according to claim 8, wherein said conductive coating on said optical fiber comprises a noble metal.

14. A sensor using metal enhanced fluorescence, comprising:

a light emitting diode (LED) having a conical shaped depression on a front end surface;

said conical shaped depression having curved sides;

said curved sides having a conductive coating on an outer surface with respect to said LED; and

wherein a radius of curvature of said curved sides is set to provide directional emissions.

15. A sensor according to claim 14, wherein said directional emissions are induced by a surface plasmon excitation of a fluorophore disposed adjacent to said conductive coating.

16. A sensor according to claim 15, wherein said conical shaped depression contains a solution containing analytes or antibodies to be analyzed.

17. A sensor according to claim 16, further comprising:

an optical plug shaped to fit in said conical shaped depression;

a detector that detects said fluorescence emissions;

a fiber having a first and second end; and

said fiber coupled to said optical plug at said first end and said detector at said second end.

18. A sensor according to claim 14, further comprising:

a plasmon reflection signal detector; and

a fluorescence emissions detector; and

wherein said plasmon reflection signal detector is provided to detect said directional emissions and said fluorescence emissions detector is provided to detect said fluorescence emissions.

19. A sensor according to claim 14, wherein said plasmon reflection signal and said fluorescence emissions appear distinctly separated when viewed from the top of said LED.

20. A sensor according to claim 14, wherein said plasmon reflection signal detector and said fluorescence emissions detector are located outside of said LED.

21. A sensor according to claim 14, wherein said plasmon reflection signal detector and said fluorescence emissions detector are located inside of said LED.

22. A sensor according to claim 14, wherein a reflective surface is used to reflect said directed emissions to said plasmon reflection signal detector and said fluorescence emissions to said fluorescence emissions detector.

23. A sensor according to claim 14, further comprising:

a porous silica layer on top of said conductive coating;

wherein said porous silica provides a size inclusion/exclusion sensing of different sized weakly fluorescent species.

24. A method of detection, comprising:

forming a front end surface of a light emitting diode (LED) to have a depression with said depression having curved sides;

setting a radius of curvature of said curved sides to provide directional emissions;

coating on an outer surface of said curved sides with a conductive material; and

inducing directional emission by surface plasmon excitation of a fluorophore disposed adjacent to said conductive material.